

WATER MANAGEMENT PLAN

Clarence Cannon National Wildlife Refuge
Annada, Missouri

Prepared by: Bradley W. McKinney Date: 1-12-87
(Assistant Refuge Manager)

Submitted by: M. Ross Adams Date: 1-13-87
(Refuge Manager)

Concurrence: [Signature] Date: 2/2/87
(Project Leader, Mark Twain NWR)

Geoff E. Cummings Date: 2-2-87
(RF-2 Biologist)

Approved by: John W. Ellis Date: 3/9/87
(RF-2 Supervisor)

WATER MANAGEMENT PLAN - 1987

PURPOSE

The purpose of this plan is to establish a schedule of operations for manipulation of managed waters on Clarence Cannon National Wildlife Refuge, and the Delair and Gardner Divisions of the Mark Twain National Wildlife Refuge during CY 1987.

OBJECTIVES

Water management plans for 1987 have been developed to meet objectives set forth in the Master Plan:

- 1) Provide migrating waterfowl with food, water, and protection during fall and spring months.
- 2) Improve and maintain existing habitat to perpetuate optimum annual production of wood ducks.
- 3) Provide other migratory species (marsh and shorebirds) with food, water, and protection.

CLARENCE CANNON NWR

General Information

Clarence Cannon NWR is located near Annada, Missouri, and contains approximately 3,736 acres, situated entirely within the Mississippi River floodplain. The refuge currently has twelve manageable moist soil units totalling approximately 1,375 surface acres, three green tree reservoirs totalling approximately 237 acres, four semi-permanent or permanent water bodies totalling approximately 72 acres, 1124 acres of recently tilled farmland, and 928 acres of other lands including administrative, water management facilities, brushland, and forestland. Variance in elevation throughout the refuge is less than four feet.

Water is supplied to managed units via a ditch system, Crissafulli pump, and a stationary 20,000 gallon per minute pump that pulls water from Bryant's Creek located adjacent to the southern boundary of the refuge. Though it certainly cannot be depended on, timely precipitation, and/or high river levels, can greatly affect operations by lowering pumping requirements.

Waterfowl maintenance objectives set forth in the Refuge Management Plan include 3,000,000 duck use days and 400,000 goose use days.

1986 Water Use Data - Cannon

Anticipating heavy spring rains, high river levels, and the resulting accumulation of seep water, moist soil unit water levels were lowered periodically during January and February. While the Mississippi River was typically high during much of March and April, precipitation was unusually low. This provided managers with a unique opportunity to measure the amount of seep water entering through the levee during high river levels. An estimated 900 acre feet entered the refuge through seeps during the spring of 1986. This variable will serve as an important factor in planning future spring water levels.

Floodwaters threatened to overtop the levee in mid-May, but then dropped and remained low allowing management to hold water in moist soil units to a minimum. However, spring seep water caused a delay of farming activities on Cannon until mid-June.

Refuge staff repaired a sluff in the north levee.

Chuck Suprenant, Fisheries Assistance, surveyed fish populations on the refuge. Sites sampled contained 90% rough fish and 10% undersized game fish.

Clean-out of the main ditch from MSU 7 to water control structure #5 began in August. To facilitate this project, water was pumped from the main ditch and into two dry moist soil units using a Crissifulli pump.

All the free gravity flow water we needed for optimum fall levels was received in late September with unusually high river levels. Managers were eagerly figuring up their savings in terms of pumping cost dollars as the river continued to rise.

The record-breaking fall flood breached the levee and broke through in three spots on October 5, flooding the refuge to depths of ten feet within 24 hours.

Although the flood served waterfowl well, damage to the levee, roads, water control structures and dikes has been estimated in excess of \$2,000,000. The flooding also postponed several work projects and interrupted many more already in progress.

By the close of the calendar year, water levels have returned to near normal. However, three gaping holes in the eastern levee remain as a very real threat to 1987 water management capabilities.

1987 Water Management Plan

PRIMARY OBJECTIVES

Our primary objective in 1987 will be:

- 1) Manipulate water levels so as to promote the growth of preferred natural waterfowl foods and to provide optimum feeding/loafing conditions during periods of migration.
- 2) Maintain increased surface acreage of semi-permanent marsh for wood duck nesting pair/brood habitat.
- 3) Perform maintenance and rehabilitation of water management facilities required for continued operation of existing facilities.
- 4) Carry out development projects that will increase moist soil unit development capabilities and enhance green tree reservoirs management.

WATER MANIPULATION

January - July

Damage during the 1986 fall flood has left three large holes in the eastern levee. This levee normally protects the refuge from high Mississippi River levels. However, river levels, especially in the spring of the year, are expected to reach the cuts in the levee as they exist now, allowing river water to enter the refuge unchecked.

Plans are being formulated at this time to repair the levee on a contract basis to its original or improved condition, providing the refuge with its original or greater flood protection. This restoration is anticipated to be completed prior to the fall migration.

During January and/or February, refuge staff, utilizing the D-8 will push temporary plugs in the three breaks to protect the refuge from floods up to 445.5 feet. If the plugs fail, floodwaters would result in major changes to the water management plan. These changes would be made on an as needed basis.

Due to high river levels and heavy precipitation during the spring, it is necessary to drain water from as much of the refuge as proper management will allow prior to March 1. This will be accomplished via gravity flow versus pumping.

By early January, the main ditch will be drained as completely and as quickly as possible with the exception of section J. In order to maintain as much water in Big Pond as possible and yet allow Stephen's Landing GTR to drain, the stoplog structure and screwgate on section J will be manipulated accordingly.

Draining the main ditch will provide ample drainage of Goose Pasture GTR, Crane Pond GTR, and Stephen's Landing GTR while holding water in low areas (Raybourn Slough, Crane Pond, Ballbush Pond) into July to facilitate wood duck production.

No MSUs are scheduled for soil disturbance in 1987. MSUs 1, 2, 4, and 5 will be allowed to hold water until mid to late June at which time they will be drawn down slowly over a two-week period. It is expected that a late and slow draw down on these sites will encourage smartweed seed production as well as millet and giant foxtail. The eastern third of MSU 2 produced a considerable amount of cocklebur and other undesirable vegetation in 1986. If, after the 1987 drawdown these species persist, the farming plan will be amended and that portion (approximately 50 acres) will be planted in wheat. Cottonwood will also be closely monitored as in 1986 it appeared as an invading species in MSU 5. If this persists in 1987, problem spots will be disced by refuge staff on an as needed basis.

Crane Pond, Supply Pond, Big Pond, Goose Pasture, and MSUs 3, 6, and 7 will be allowed to dry via evaporation. These sites are expected to retain surface water through mid-July. As well as providing ample marsh/wading bird and duck production habitat, favorable vegetative response is expected to include millets, smartweed, and rice cutgrass.

This schedule of draw downs is expected to provide optimum habitat for spring migrants, ample waterfowl production habitat and preferred vegetative and seed production for the fall migrants.

August - December

Prior to commencement of pumping operations in October, water control structures will be manipulated when possible to trap and utilize precipitation in promoting the growth of preferred vegetation. Timely rains after early September can be trapped in MSUs and lessen pumping requirements.

Reflooding of moist soil units, green tree reservoirs, and semi-permanent marshes requires water to be backed up in the main ditch to a high level by utilizing a 20,000 gal./min. stationary pump and manipulating water control structures. Reflooding of units will commence upon arrival of early migrant waterfowl, which is expected around September 15.

Water levels will be brought up slowly (2-3 week period) in units to provide increased use days by waterfowl. Moist soil units will be flooded to an overall average depth of 2-12 inches. Because of the irregular topography within refuge MSUs, water levels may range from 0-30 inches, which is conducive to attracting several different migratory species which have different preferences for water depths. Average water depths in MSUs will not be allowed to reach over 14 inches.

The following units are scheduled for reflooding for utilization by fall migrants:

Supply Pond	- 37 ac.	Goose Pasture	- 120 ac.
MSU 1	- 47 ac.	Crane Pond	- 21 ac.
MSU 2	- 154 ac.	Rabbit Ears Marsh	- 20 ac.
MSU 3	- 163 ac.	Stephen's Landing GTR	- 64 ac.
MSU 4	- 82 ac.	Goose Pasture GTR	- 88 ac.
MSU 5	- 126 ac.	Crane Pond GTR	- 85 ac.
MSU 6	- 37 ac.	Big Pond	- 90 ac.
MSU 7	- 465 ac.		

Total fall-flooded acreage is approximately 1,600 surface acres, plus 17 additional naturally-flooded acres in Raybourn Slough and Ballbush Pond.

Fall pumping requirements are dependent on precipitation, and pumping schedules have to be planned according to precipitation totals prior to and during fall migration. However, due to budget and fuel allocation constraints, management will be limited to using no more than approximately 2,000 gallons of fuel to accomplish the proposed reflooding plan.

The following schedule is the basic plan of action to work from in reflooding units.

1. Upon arrival of early migrant waterfowl, begin pumping water into main ditch to back-fill units. This requires closure of all water control structures south of structure D except for gates A and C (Double Main). Water is back-filled in main ditch sections C and (part of) A to an elevation sufficient to begin flooding MSUs.
2. Control structures on Supply Pond, MSU 1, and MSU 2 are opened partially to slowly flood these units. Pumps shall be operated intermittently so that it takes approximately ten days to gain approximately 100 surface acres of water in these units.
3. Both structures on Big Pond shall then be opened to shallowly flood that unit and to draw water into Stephen's Landing GTR. This shall be accomplished in approximately seven days.
4. Water will then be back-filled into main ditch section A behind structure C (Double Main). Control structures on MSU 3, MSU 4, MSU 5, and MSU 6 are opened partially to shallowly flood these units over a 14-day period.

By this time, there should be approximately 660 surface acres of water available (45% total planned) by mid-October, which begins the peak migration period for waterfowl.

5. Water is then back-filled into main ditch B, D, and E, which will allow slow flooding of MSU 7 and Goose Pasture GTR.
6. Structure E (#5) is then opened to draw water into Crane Pond and Crane Pond GTR.

7. Depending on the availability of fuel, a Crisafulli pump may be utilized to flood Goose Pasture over a seven day period in late fall.
8. All water control structures are manipulated to maintain planned water levels in impoundments.
9. Beginning in mid-December, drainage of the main ditch via gravity flow is initiated.

MANAGEMENT PROJECTS

Maintenance, rehabilitation, and development projects will be accomplished on a priority basis according to the Refuge Water Management Plan. Further descriptions of projects cited here are available in that plan.

MAINTENANCE

1. Prescribed burn water management facilities including levees, dikes, and roadsides according to the Annual Burn Plan.
2. Carry out maintenance mowing of water management facilities including levees, dikes, and roadsides after the major nesting season, which ends on or about July 20.

Carry out mowing of rank vegetation within MSUs to provide open water and travel lanes for waterfowl. Mowing requirements are dependent on vegetation type and density, but are usually called for when vegetative transects reveal a density in excess of 50 stems/station.

3. Replace leaking stoplog structure at Big Pond and sump. Also sump MSU 7 northern stoplog structure. Both require removal of silt to three feet below the pipe.
4. Place trash guards on structure D and Big Pond screwgate.

REHABILITATION

1. Using the D-8 push temporary plugs in the three levee breaks prior to March 1 to protect the refuge from floods up to 445.5 feet mean sea level. Such plugs will reduce the chances of the refuge flooding in the spring to 50:50.
2. Replace 36" CMP at Hemphill Crossing with 30 feet of 4' square concrete box culverts on hand.
3. Finish rehabilitating main ditch section E. Requires removal of woody vegetation, silt, and debris to three feet in depth.
4. Complete rehabilitation of main ditch section L already in progress using spoil to form western dike of future moist soil unit in existing ag field 13.

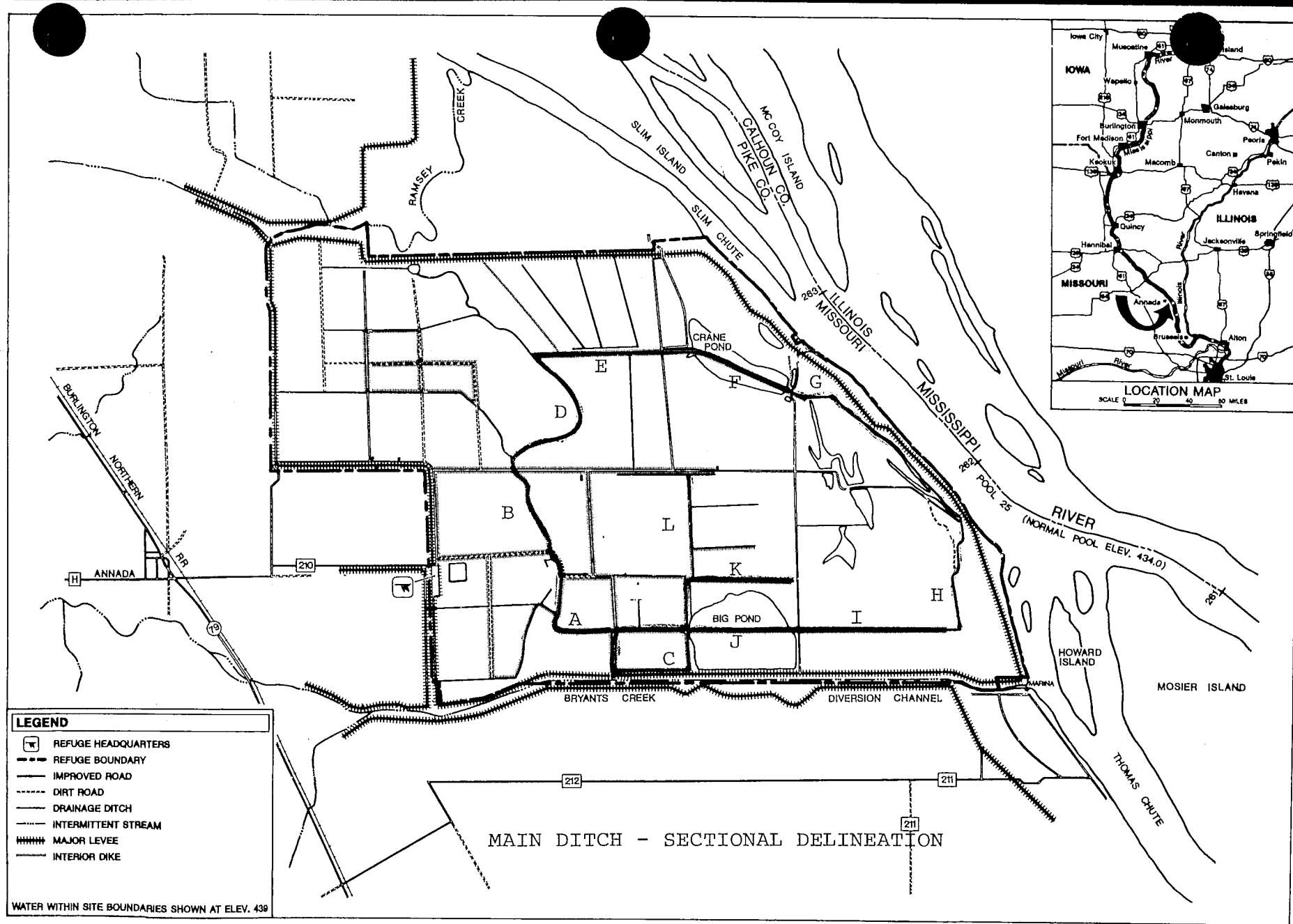
5. Utilizing 16" field ditcher and road grader, recut field (MSU) ditches as necessary.

DEVELOPMENT

1. Complete development of MSU 7 using road grader and/or D-4 and extending low level dike to further divorce unit from Goose Pasture GTR. An 18" pipe and screwgate will be placed in the north ditch.
2. Develop existing fallow field 20 into a moist soil unit (MSU 9) using the D-4 and extending the eastern edge to the north and tying into the main ditch dike. An extension to the south will also be needed to tie the eastern edge into the Bryant's Creek levee. A 24" tube with a stoplog structure will be placed in the northern extension allowing water to be brought in from the main ditch.
3. Private funding may be available to raise the north/south "Goose Pasture" road approximately two feet to the elevation of the east/west roadway. If this road is in fact raised, MSU 8 will be developed for account as described in IPW CAN-48.

MONITORING AND EVALUATION

Monitoring and evaluation of water management strategies will be conducted in accordance with the Refuge Water Management Plan.

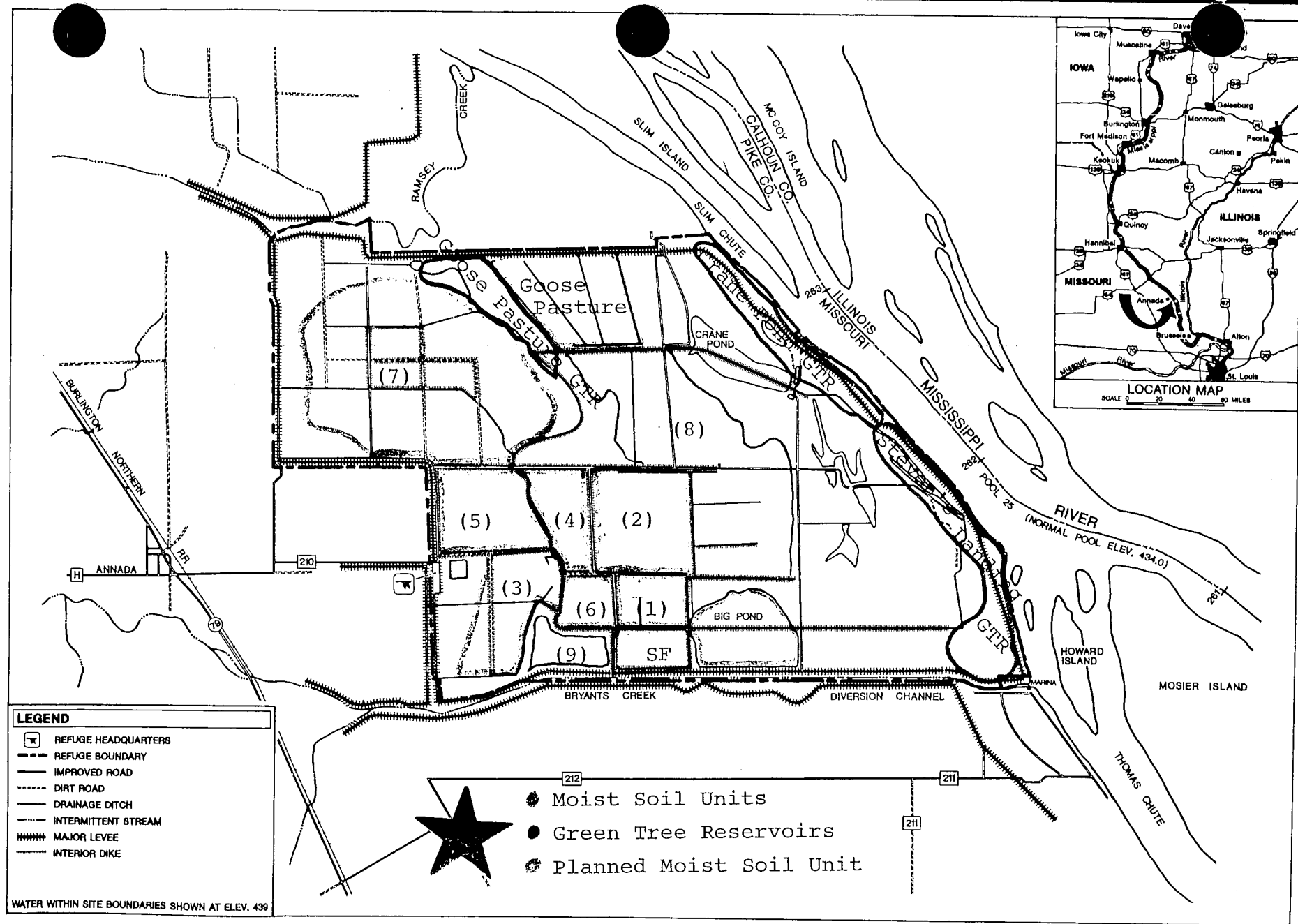


CLARENCE CANNON N.W.R.

MARK TWAIN NATIONAL WILDLIFE REFUGE

U.S. FISH AND WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR





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Appendix A

1986 Weather Data

<u>Month</u>	<u>Total Precip.</u>	<u>50 Yr. Average</u>	<u>No. Days Precip.</u>	<u>Temp. Extremes</u>	
				<u>Max.</u>	<u>Min.</u>
Jan.	.06	1.78	1	68	-4
Feb.	1.56	1.80	6	64	-8
Mar.	1.09	3.04	7	87	18
Apr.	1.30	3.62	7	93	31
May	3.32	3.81	9	88	42
June	3.29	4.01	7	94	56
July	4.30	3.61	9	98	60
Aug.	.97	3.46	10	98	39
Sep.	5.23	3.37	12	90	37
Oct.	4.60	2.95	5	78	34
Nov.	1.69	2.42	3	72	10
Dec.	<u>2.73</u>	<u>2.12</u>	<u>7</u>	52	10
Total	30.14	35.99			

APPENDIX B

ANNUAL MSU EVALUATION

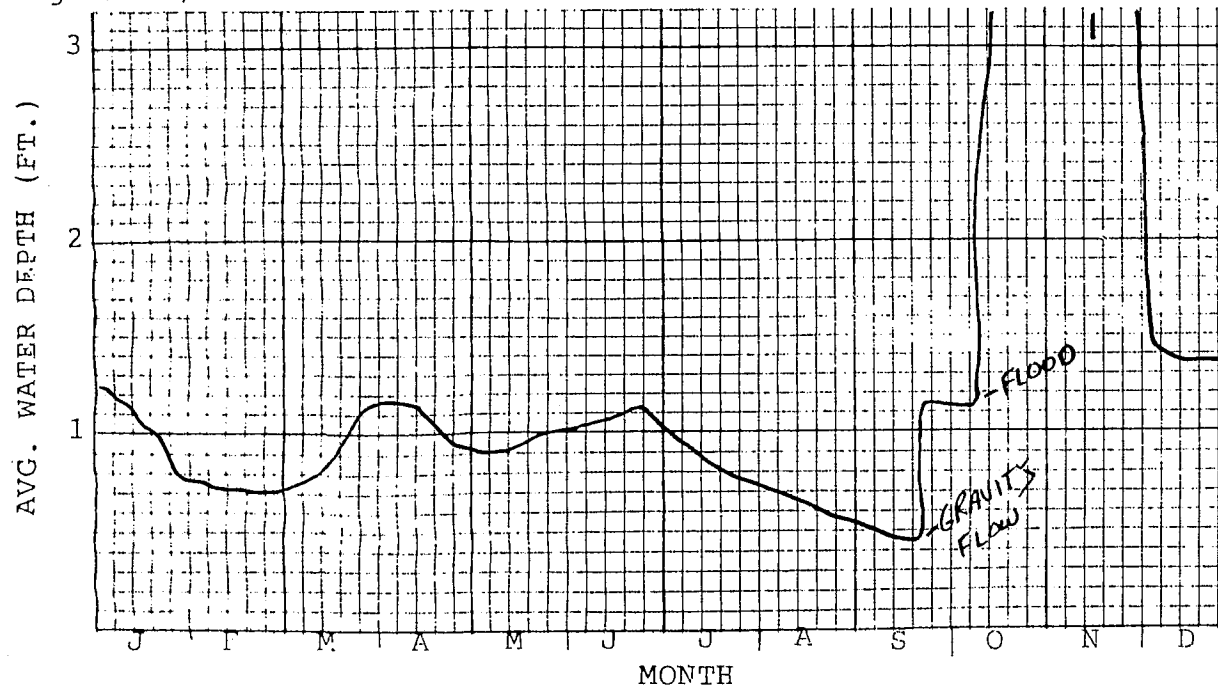
MARSH AND WATER MANAGEMENT PLAN - ANNUAL MSU EVALUATION

Supply
MSU # Pond YEAR 19 86

VEGETATIVE TRANSECT DATE 9-22-86

DOMINANT VEGETATION	%
Eleocharis	21
Bidens	20
Marsh Smartweed	18
Sumpweed	9
Rice Cutgrass	7
Water plantain	6
Nutgrass	6
Cocklebur	.5

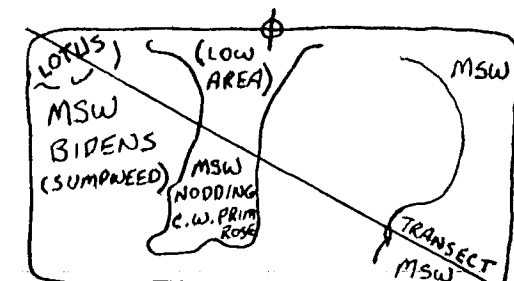
Avg. STEM/M² = 124



SOIL AND VEGETATION TR

NONE

SKETCH



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WILDLIFE USE

	USE DAYS	% CHANGE FROM 19
DUCKS	112,937	
GEESE	20,623	
THR. SPP.		
OTHER MIG.		
WF PROD.	2 wood duck broods	

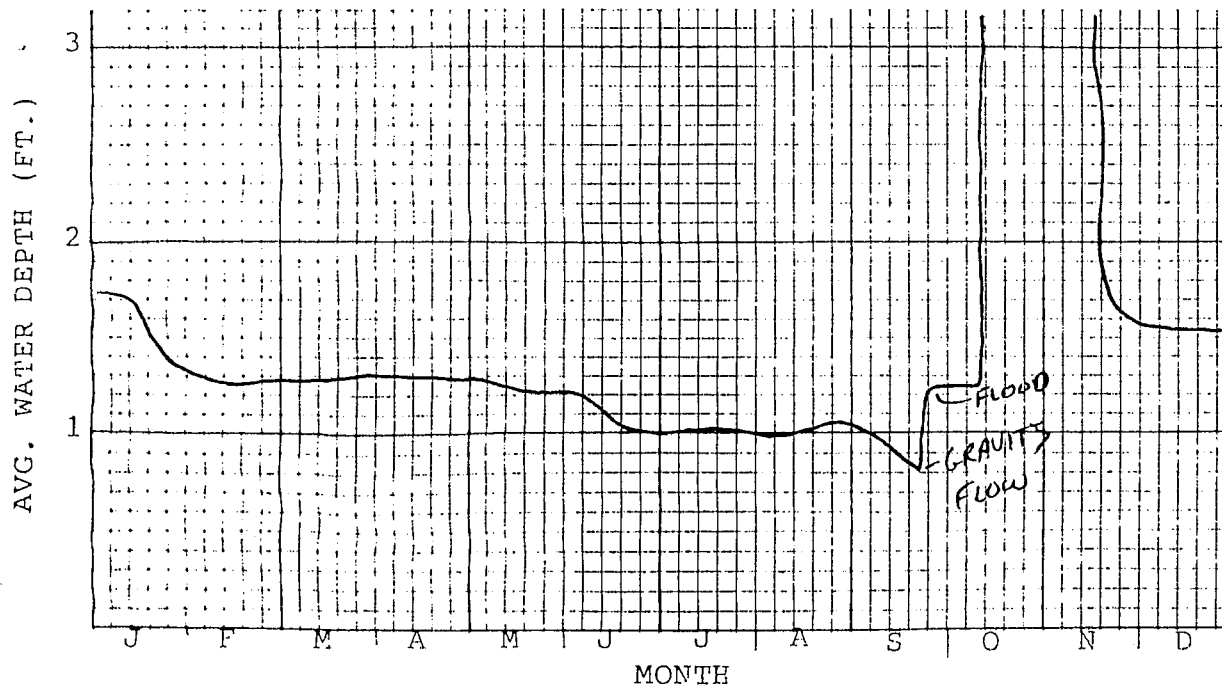
MARSH AND WATER MANAGEMENT PLAN - ANNUAL MSU EVALUATION

MSU # 1 YEAR 1986

VEGETATIVE TRANSECT DATE 9-2-86

DOMINANT VEGETATION	%
<u>Toothcup</u>	<u>44</u>
<u>Elocharis</u>	<u>17</u>
<u>Nutgrass</u>	<u>10</u>
<u>Marsh Smartweed</u>	<u>10</u>
<u>C. Water Primrose</u>	<u>5</u>
<u>Cocklebur</u>	<u>5</u>

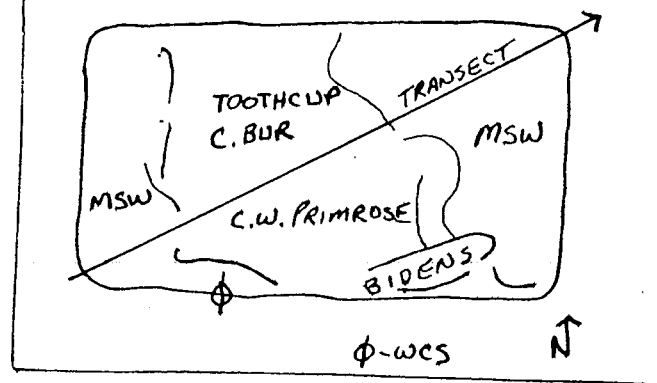
Avg. STEM/M² = 167



SOIL AND VEGETATION TREATMENT

NONE

SKETCH



WILDLIFE USE

	USE DAYS	% CHANGE FROM 19 <u> </u>
DUCKS	<u>367,638</u>	<u> </u>
GEESE	<u>74,690</u>	<u> </u>
THR. SPP.	<u> </u>	<u> </u>
OTHER MIG.	<u> </u>	<u> </u>
WF PROD.	<u> </u>	<u> </u>

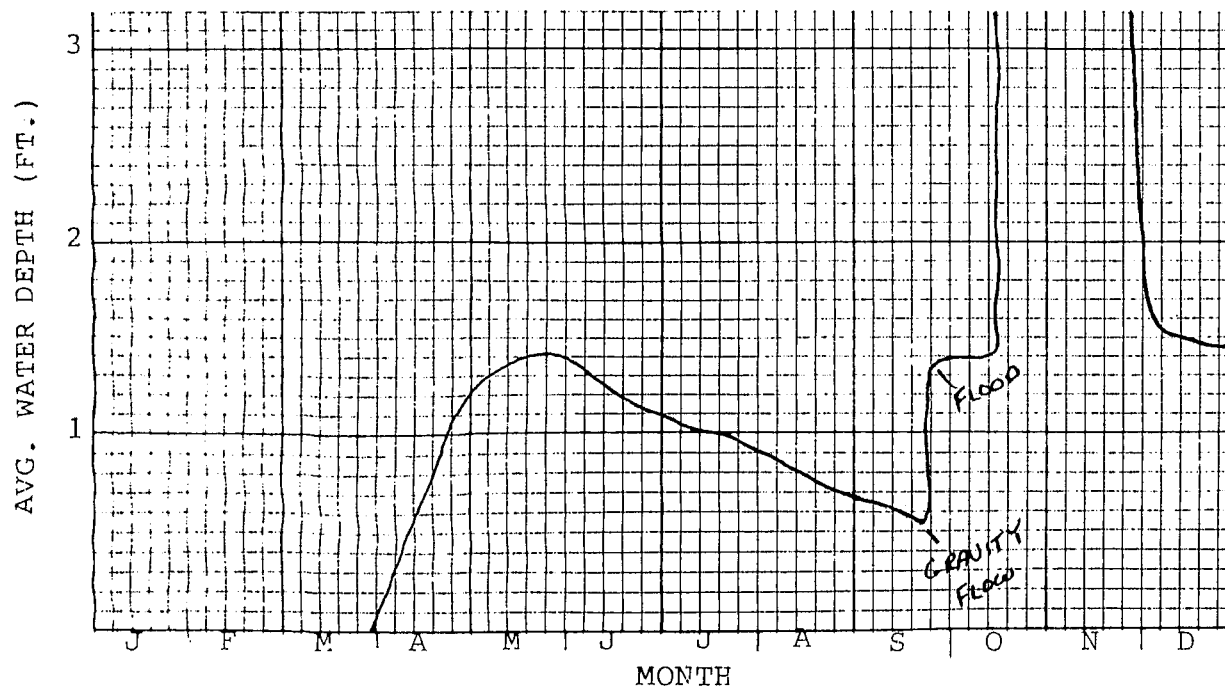
MARSH AND WATER MANAGEMENT PLAN - ANNUAL MSU EVALUATION

MSU # 2 YEAR 1986

VEGETATIVE TRANSECT DATE 9-2-86

DOMINANT VEGETATION	%
Cocklebur	20
Panicum Grass	20
Foxtail	13
Dark Millet	10
Eleocharis	7
Pale Millet	7

Avg. STEM/M² = 170

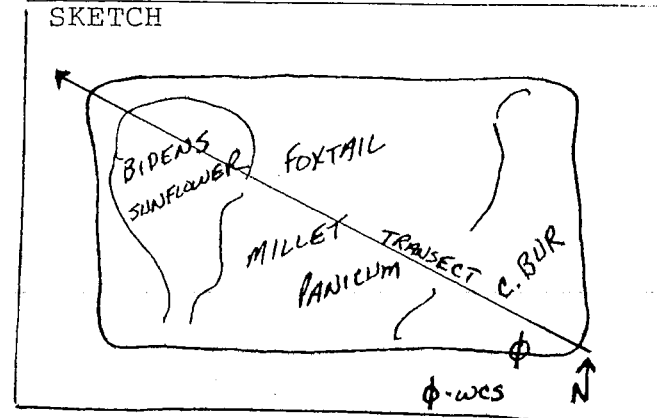


MSU 2 screwgate was repaired late 1985. This unit remained dry until unusual rise in river beginning 3-25-86 allowed gravity flow in.

SOIL AND VEGETATION TREATMENT

NONE

SKETCH



WILDLIFE USE

	USE DAYS	% CHANGE FROM 19 <u>85</u>
DUCKS	461,337	
GEESE	7,597	
THR. SPP.		
OTHER MIG.		
WF PROD.	1 wood duck brood	

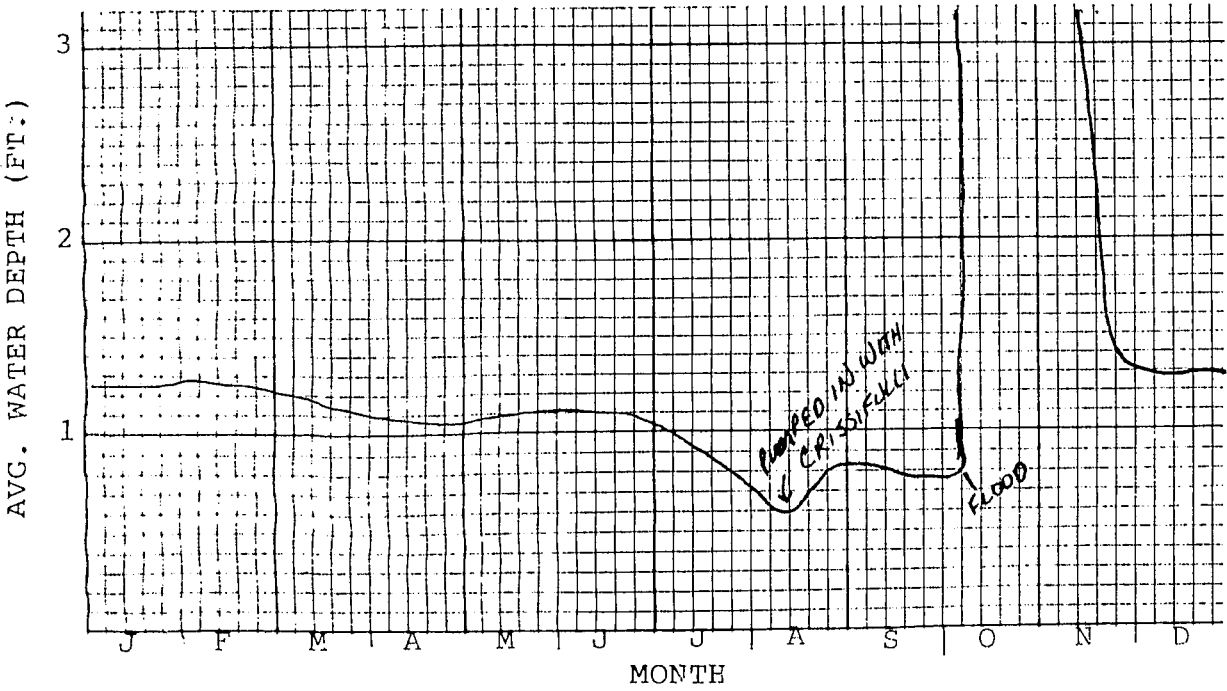
MARSH AND WATER MANAGEMENT PLAN - ANNUAL MSU EVALUATION

MSU # 3 YEAR 1986

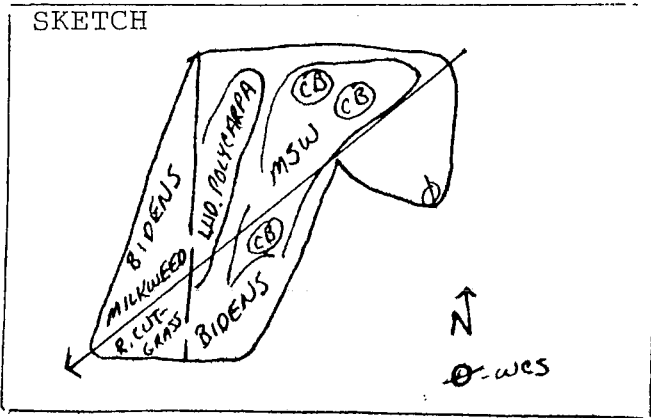
VEGETATIVE TRANSECT DATE 10-2-86

DOMINANT VEGETATION	%
Marsh Smartweed	29
Cocklebur	27
Bidens	11
C. Water Primrose	9
Ludwigia Polycarpa	8
Eleocharis	7

Avg. STEM/M² = 79



SOIL AND VEGETATION TRENT
NONE



WILDLIFE USE	USE DAYS	% CHANGE FROM 19 <u>85</u>
DUCKS	459,452	
GEESE	22,310	
THR. SPP.		
OTHER MIG.		
WF PROD.	4 wood duck broods	
	1 mallard brood	

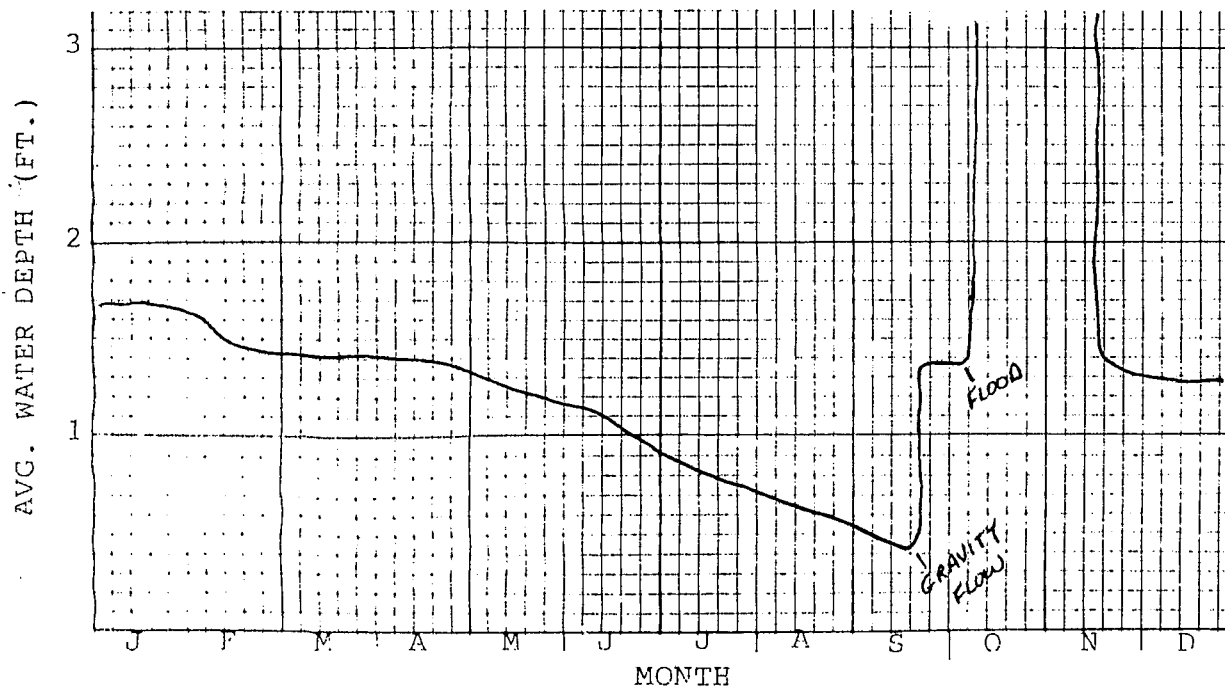
MARSH AND WATER MANAGEMENT PLAN - ANNUAL MSU EVALUATION

MSU # 4 YEAR 1986

VEGETATIVE TRANSECT DATE 9-12-86

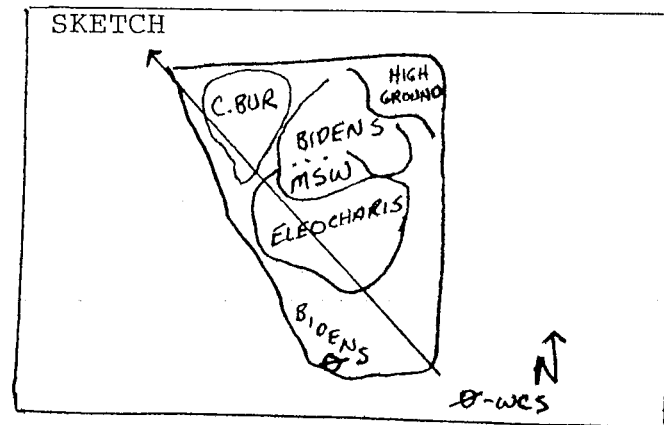
DOMINANT VEGETATION	%
Elecharis	43
Cocklebur	9
Pale Millet	8
Dark Millet	7
C. Water Primrose	7
Marsh Smartweed	7

Avg. STEM/M² = 169



SOIL AND VEGETATION TR ENT

NONE



WILDLIFE USE

	USE DAYS	% CHANGE FROM 19__
DUCKS	177,196	
GEESE	25,030	
THR. SPP.		
OTHER MIG.		
WF PROD.	3 wood duck	broods

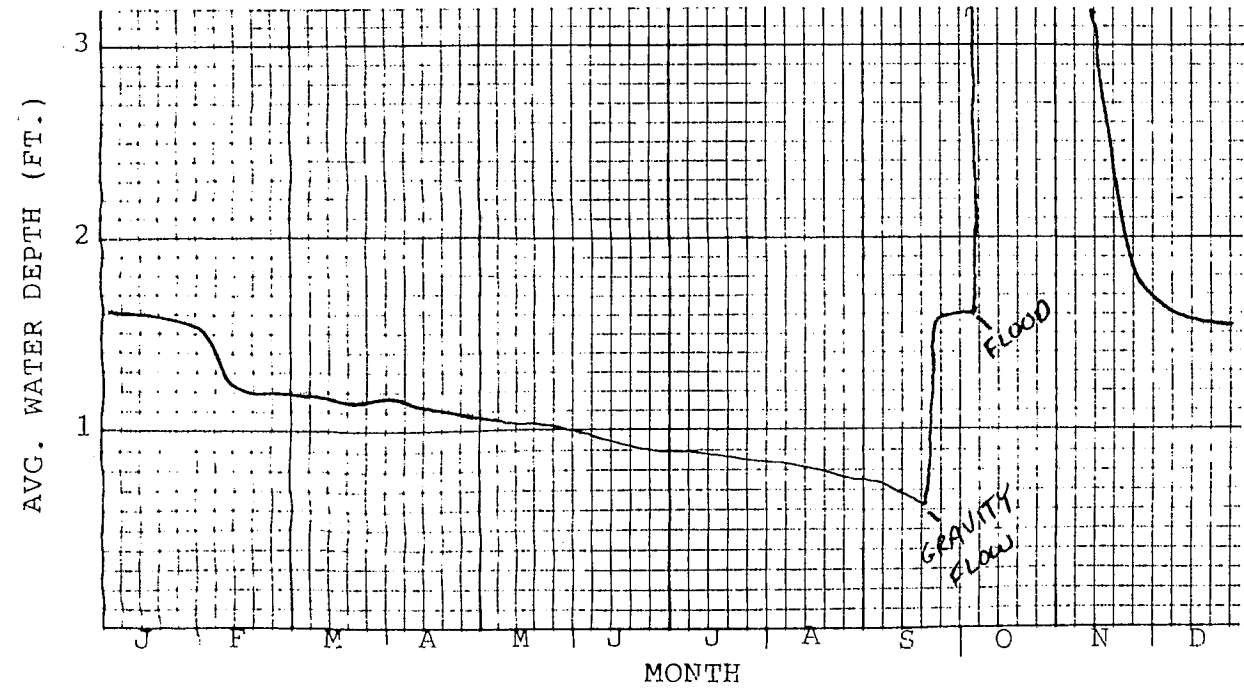
MARSH AND WATER MANAGEMENT PLAN - ANNUAL MSU EVALUATION

MSU # 5 YEAR 1986

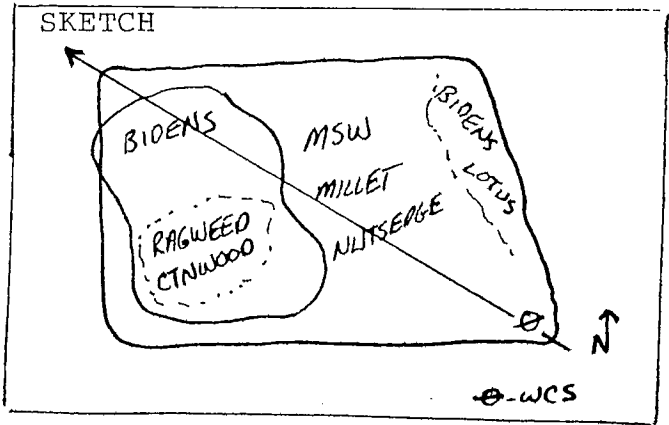
VEGETATIVE TRANSECT DATE 9-4-86

DOMINANT VEGETATION	%
Marsh Smartweed	18
Toothcup	14
Bidens	13
Pale Millet	13
Smooth Pigweed	11
Nutgrass	10
Dark Millet	6

Avg. STEM/M² = 74



SOIL AND VEGETATION TREATMENT
NONE



WILDLIFE USE

	USE DAYS	% CHANGE FROM 19 <u> </u>
DUCKS	316,233	
GEESE	101,306	
THR. SPP.		
OTHER MIG.		
WF PROD.	5 wood duck	broods

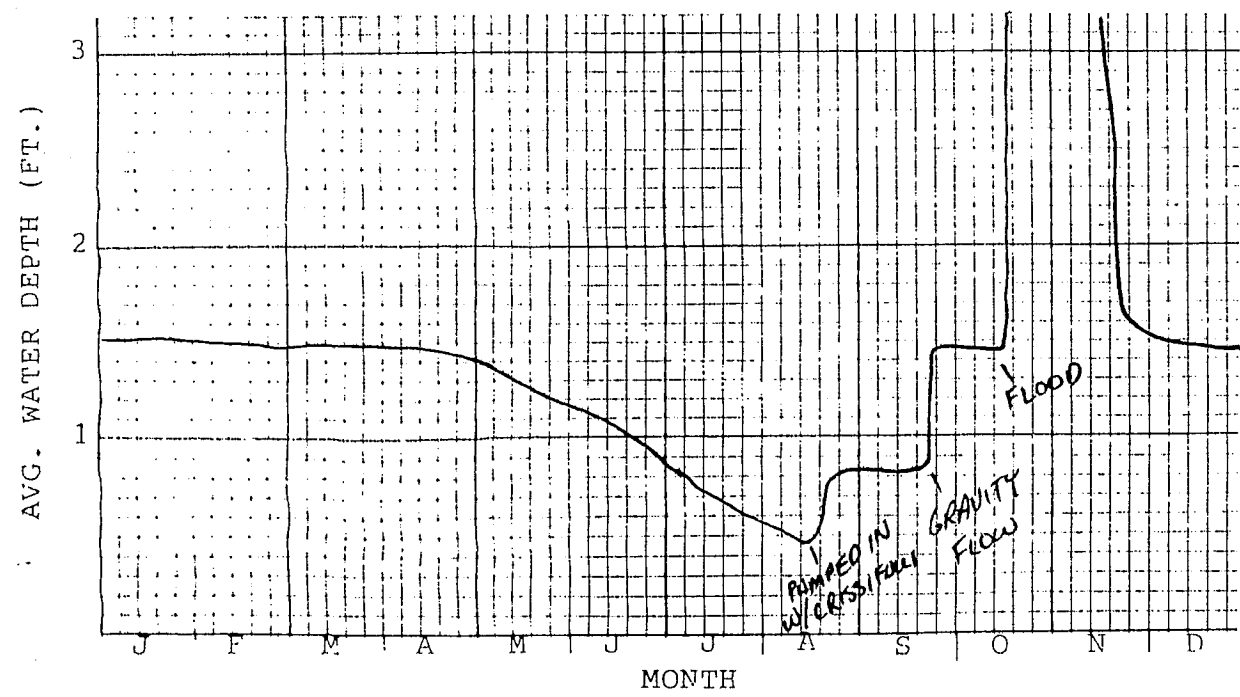
MARSH AND WATER MANAGEMENT PLAN - ANNUAL MSU EVALUATION

MSU # 6 YEAR 1986

VEGETATIVE TRANSECT DATE *

DOMINANT VEGETATION **	%
<u>Marsh Smartweed</u>	<u> </u>
<u>Smooth Pigweed</u>	<u> </u>
<u>Millet</u>	<u> </u>
<u>Foxtail</u>	<u> </u>
<u> </u>	<u> </u>
<u> </u>	<u> </u>

* Flooding occurred before transects were completed.
** Based on casual observations and 1985 data.



SOIL AND VEGETATION TREATMENT

NONE

SKETCH

WILDLIFE USE

	USE DAYS	% CHANGE FROM 19 <u> </u>
DUCKS	<u>149,528</u>	<u> </u>
GEESE	<u>4,209</u>	<u> </u>
THR. SPP.	<u> </u>	<u> </u>
OTHER MIG.	<u> </u>	<u> </u>
WF PROD.	<u>1 wood duck brood</u>	<u> </u>
	<u>2 mallard broods</u>	<u> </u>

MARSH AND WATER MANAGEMENT PLAN - ANNUAL MSU EVALUATION

MSU # 7 YEAR 1986

VEGETATIVE TRANSECT DATE *

DOMINANT VEGETATION **	%
Bidens	
Marsh Smartweed	
Millet	
Sumpweed	

* Flooding occurred before transects were completed.

** Based on casual observation and 1985 data.



Faulty Stop log structure Resulted in unit draining dry twice. Problem corrected in August.

SOIL AND VEGETATION TRENT

NONE

SKETCH

WILDLIFE USE

	USE DAYS	% CHANGE FROM 19 <u> </u>
DUCKS	619,747	
GEESE	9,537	
THR. SPP.		
OTHER MIG.		
WF PROD.	8 wood duck broods	
	2 mallard broods	

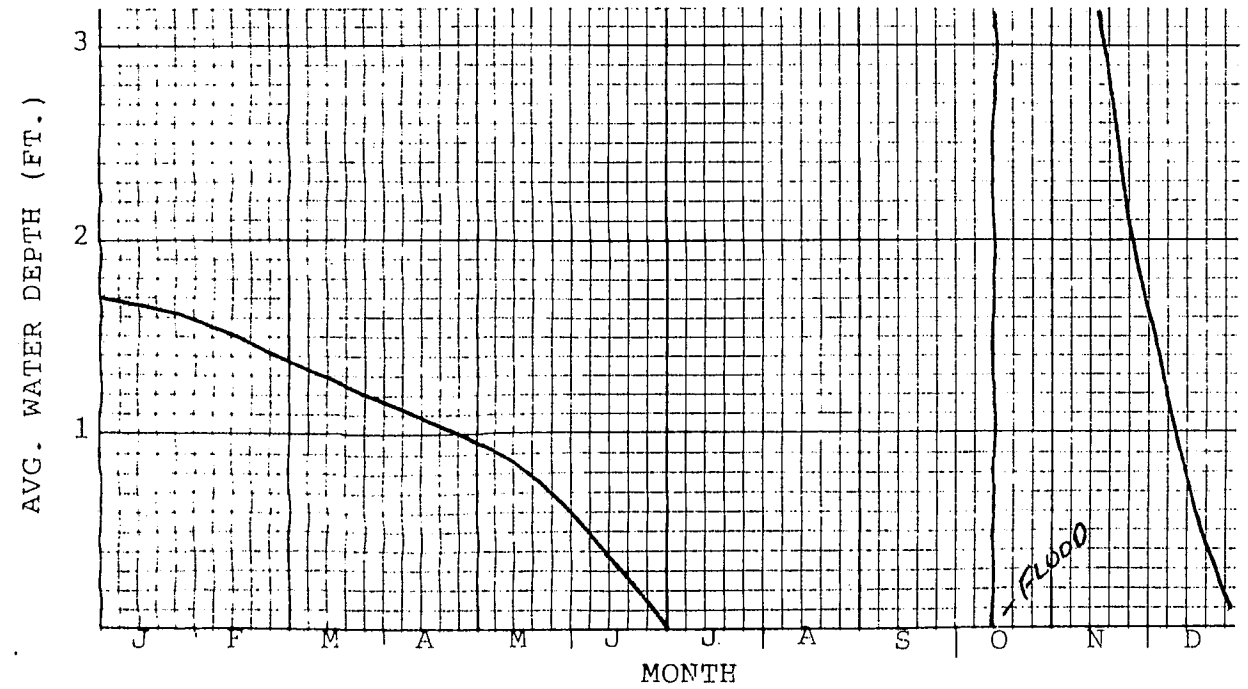
MARSH AND WATER MANAGEMENT PLAN - ANNUAL MSU EVALUATION
Goose
MSU # Pasture YEAR 19 86

VEGETATIVE TRANSECT DATE 9-12-86

DOMINANT VEGETATION	%
Marsh Smartweed	30
Ludwigia Polycarpa	19
Cocklebur	14
Bidens	13
Water Plantain	10
Nutgrass	9

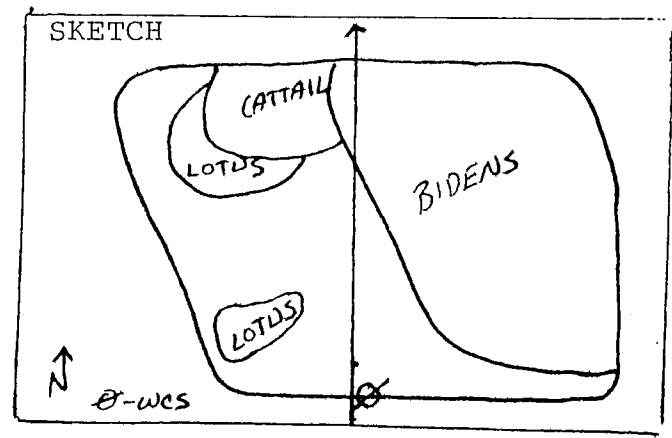
Avg. STEM/M² = 82

Bidens compose larger % than transect shows.
Lotus present in significant numbers. (Also not shown by transect)



Slow leak at stop log structure.

SOIL AND VEGETATION TREATMENT
NONE



WILDLIFE USE

	USE DAYS	% CHANGE FROM 19__
DUCKS	259,411	
GEESE	127,286	
THR. SPP.		
OTHER MIG.		
WF PROD.		

MARSH AND WATER MANAGEMENT PLAN - ANNUAL MSU EVALUATION

MSU # Big Pond YEAR 1986

VEGETATIVE TRANSECT DATE _____ *

DOMINANT VEGETATION ** %

Penn. Smartweed _____

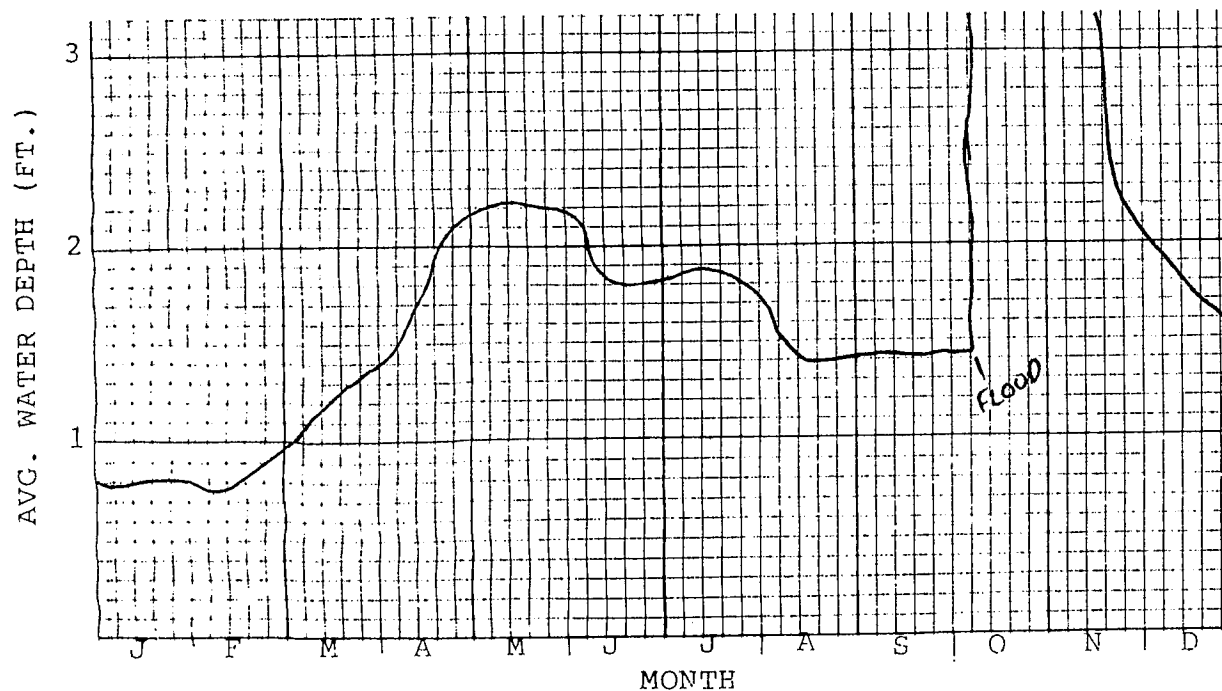
Marsh Smartweed _____

Spikerush _____

Lotus _____

* Flooding occurred before transects were completed.

** Based on casual observation and 1985 data.



Fluctuates with main ditch.

SOIL AND VEGETATION TRINENT

NONE

SKETCH

WILDLIFE USE

	USE DAYS	% CHANGE FROM 19__
DUCKS	<u>731,984</u>	_____
GEESE	<u>391,876</u>	_____
THR. SPP.	_____	_____
OTHER MIG.	_____	_____
WF PROD.	<u>6 wood duck broods</u>	_____

MARSH AND WATER MANAGEMENT PLAN - ANNUAL MSU EVALUATION

MSU # Crane Pond YEAR 1986

VEGETATIVE TRANSECT DATE *

DOMINANT VEGETATION ** %

Big Burreed

Marsh Smartweed

Bullrush

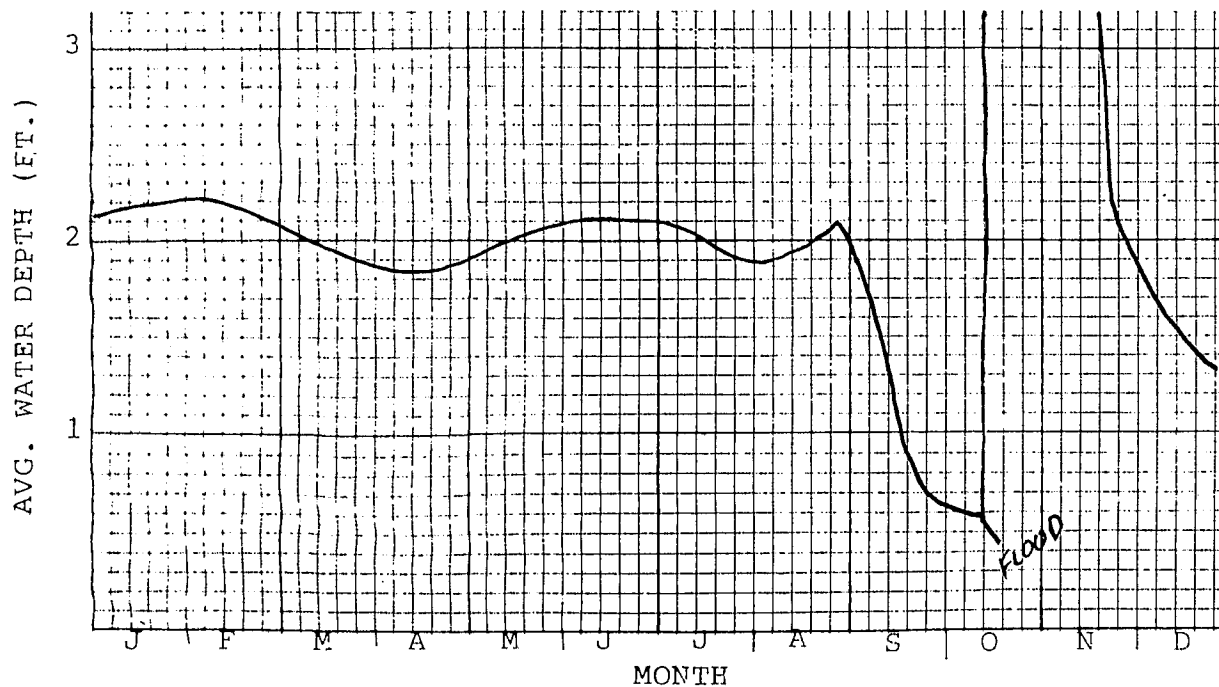
Spikerush

C. Water Primrose

Lotus

* Flooding occurred before transects were completed.

** Based on casual observation and 1985 data.



SOIL AND VEGETATION TR ENT
NONE

SKETCH

WILDLIFE USE

	USE DAYS	% CHANGE FROM 19 <u> </u>
DUCKS	401,421	<u> </u>
GEESE	113,263	<u> </u>
THR. SPP.	<u> </u>	<u> </u>
OTHER MIG.	<u> </u>	<u> </u>
WF PROD.	4 wood duck broods	<u> </u>

WATERFOWL MAINTENANCE

1986

DIVISION Cannon

NUMBER OF CENSUSES PERFORMED

TOTAL DUCKS CENSUSED 797,604

EST. DUCK USE DAYS 5,370,805

TOTAL GEESE CENSUSED 208,452

EST. GOOSE USE DAYS 1,251,855

Moist Soil Units	Unit	Censused Ducks	Est. Duck, Use Days:	X X X	Censused Geese	Est. Goose Use Days
	SP	16,772	112,937	X X	3,434	20,623
	MSU 1	54,597	367,638	X X	12,437	74,690
	MSU 2	68,512	461,337	X X	1,265	7,597
	MSU 3	68,232	459,452	X X	3,715	22,310
	MSU 4	26,315	177,196	X X	4,168	25,030
	MSU 5	46,963	316,233	X X	16,869	101,306
	MSU 6	22,206	149,528	X X	701	4,209
	MSU 7	92,037	619,747	X X	1,588	9,537
	GP	38,376	258,411	X X	21,195	127,286
	BP	108,705	731,984	X X	65,253	391,876
	CP	59,614	401,421	X X	18,860	113,263
	RE	12,636	85,086	X X	3,694	22,184
	U RE	417	2,808	X X		
				X X		
	Green Tree Reservoirs	GP GTR	1,346	9,063	X X	
CP GTR		8,736	58,825	X X		
SL GTR		7,047	47,452	X X		
				X X		
				X X		
Ag Units	CORN	27,830	187,398	X X	15,670	94,106
	WHEAT	5,850	39,392	X X	6,625	39,786
	BEANS	35,708	240,445	X X	14,850	89,181
				X X		

DELAIR DIVISION

General Information

Delair NWR is located in Pike County, Illinois, approximately three miles south of the Louisiana, Missouri bridge, adjacent to the navigational pool No. 24 of the Mississippi River. The area, protected from the river by a levee, is 1,620 acres of cropland, marsh, and water. The amount of land tilled in the past several years averages approximately 650 acres.

Delair has several permanent and semi-permanent water areas: Upper Swan Lake-36 acres, Lower Swan Lake-55 acres, Upper Butcher Pond-8 acres, Lower Butcher Pond-31 acres, Hanei Pool-11 acres, Flake Hole-15 acres, and 15 acres of scattered ponds in farm fields. All of these units except the five scattered ponds, are connected by a drainage system to a central outlet to the Sny Island Drainage District System.

All lands on Delair are one to ten feet below normal pool stage of navigational pool No. 24. Because of this, water is provided to the area via seeps and gravity flow throughout the year.

Waterfowl maintenance objectives set forth in the Refuge Management Plan include 2,000,000 duck use days and 500,000 goose use days.

1986 Water Use Data - Delair

As planned, a low level dike was constructed to protect roads from the Cattail Marsh during periods of high water from back-filling. This dike now permits a more extensive covering of surface water throughout the Cattail Marsh.

A 36" pipe with screwgate was installed to divert some seep water away from Lower Swan Lake and into low lying timbered areas and fields for additional surface water potential.

1987 Water Management Plan

Primary Objectives

1. Manipulate water levels so as to promote the growth of preferred natural waterfowl foods, and provide optimum feeding/loafing conditions during periods of migration.
2. Perform extensive rehabilitation to 17,400 feet of ditches throughout the Cattail Marsh, Upper and Lower Swan Lakes, and Upper Butcher Pond restoring proper water control.
3. Maintain adequate water levels in Hanei and Lower Butcher for wood duck production.

WATER MANIPULATION

January - June

While preventing water from crossing roadways, as much water will continue to be held in Cattail Marsh by the Swan Inlet structure. Water will be held in Upper and Lower Swan, Hanei Pool, and Upper and Lower Butcher throughout the winter as well.

In order to restore proper water control 17,400 feet of ditching will occur along the Swan Lakes Junction, Swan Inlet, Upper Butcher Outlet and throughout the Cattail Marsh. This work will be accomplished by contract.

Cattail Marsh will be drained as completely as possible beginning April 1, after the spring migration, to prepare the site for backhoe ditching. Water levels in the Swan Lakes, Swan Outlet, and Upper Butcher Outlet will be held at depths suitable for dredging which will begin at this time as well.

Immediately after the dredge work is completed, Upper and Lower Swan Lakes and Upper Butcher Pond will be drained as much as possible. The draining of these sites will generate mudflats and low lying pools for migrating wading/shore birds. Keeping these sites drained through August is expected to encourage sprangletop, millet, and rice cutgrass as well as help control a rough fish problem.

Hanei Pool and Lower Butcher Pond will be maintained holding as much water as possible through June extending flooded acreage into nearby timber for wood duck production.

September - December

Upper Butcher Outlet will be manipulated to bring water up slowly (two to three week period) in Swan Lakes and Upper Butcher Pond after September 15 providing these revegetated areas with a covering of no more than ten inches of water.

After October 1, Hanei Pool and Lower Butcher Pond stoplog structures will be manipulated to bring water slowly into these units.

Swan Inlet structure will then be manipulated to backfill portions of the Cattail Marsh.

MANAGEMENT PROJECTS

MAINTENANCE

1. Prescribe burn according to Annual Burn Plan.
2. Carry out maintenance mowing of water management facilities including levees, dikes, and roadsides after the major nesting season, which ends on or about July 20.

REHABILITATION

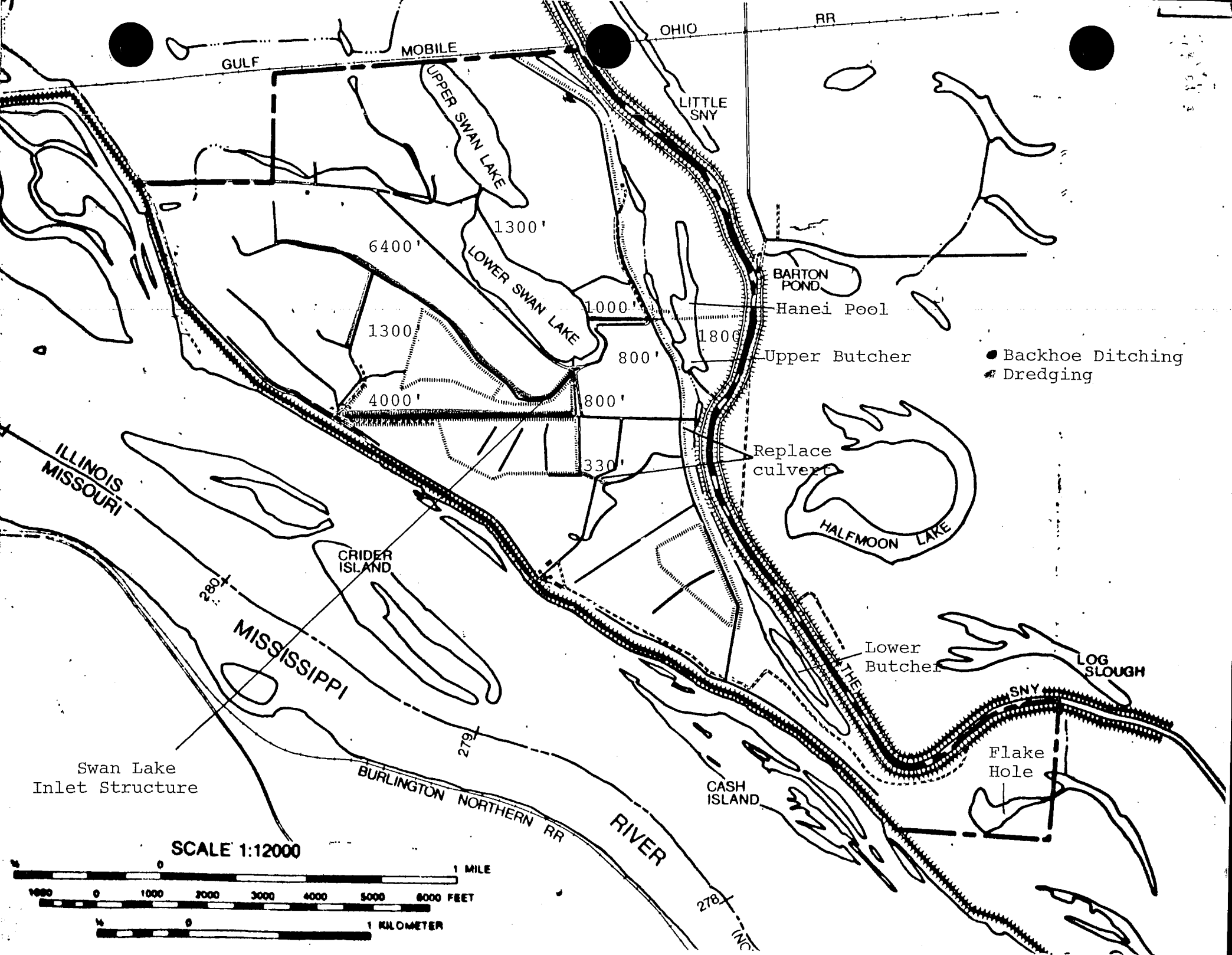
1. Over 17,000 feet of ditch work is scheduled to begin as soon after the spring waterfowl migration as possible. This project is expected to restore proper drainage throughout the Delair Division. This work will be done by contract utilizing a backhoe and dredge.

DEVELOPMENT

1. As time permits, the contracted backhoe will also be used to recut 330 feet of an existing ditch near the southeast corner of Cattail Marsh and to replace a culvert under the gravel road leading to the Sny. This project will allow management to divert seep water from Cattail Marsh to low lying timbered areas and fields for additional surface water potential.

MONITORING AND EVALUATION

Monitoring and evaluation of the Water Management Plan on Delair will be the same as for Clarence Cannon NWR.



1986

TOTAL GEESE CENSUSED 211,782 EST. GOOSE USE DAYS 1,246,579

Unit	Censused Ducks	Est. Duck Use Days	X X	Censused Geese	Est. Goose Use Days
USL	2,747	16,939	X X X	8,428	49,608
LSL	59,534	367,099	X X X	108,488	638,576
Hanei	2,973	18,332	X X X	4,797	28,236
UBP	11,606	71,565	X X X	20,918	123,126
LBP	2,467	15,212	X X X	3,130	18,424
Cat. Mar.	57,841	356,659	X X X	13,248	77,979
Corn	15,148	93,406	X X X	15,221	89,593
Wheat	5,300	32,681	X X X	30,440	179,174
Beans			X X X	6,800	40,026
Upper H.	91	561	X X X		
Pete's P.	74	456	X X X		
Flake H.	500	3,083	X X X	300	1,766
Fallow	200	1,233	X X X		
			X X X		
			X X X		
			X X X		

GARDNER DIVISION

General Information

The Gardner Division is 6,300 acres of river bottom mainland and 32 adjoining islands in the Mississippi River, pool No. 21, about six miles upstream from Quincy, Illinois.

This Division of the Mark Twain National Wildlife Refuge is General Plan Lands owned by the U.S. Army Corps of Engineers and cooperatively managed by the U.S. Fish and Wildlife Service.

The Division contains 4,670 acres of mature bottomland hardwoods and 882 acres of croplands. Lakes, sloughs, and ponds existing on the area account for approximately 600 acres.

Access to the majority of the Division is by boat only and, coupled with the great distance from refuge headquarters in Annada, Missouri, limits management activities by refuge personnel.

Waterfowl maintenance objectives set forth in the Master Plan include 1,775,000 duck use days and 3,000 goose use days. Waterfowl production objectives include the annual production of 1,200 wood ducks.

1987 Water Management Plan

WATER MANIPULATION

Attempts at water management on Gardner, especially moist soil developments, have met with little success in previous years. Sandy soils on the area cause percolation of water from MSU's. Because of its location and low elevation, the area is highly subject to total inundation by untimely rise in the river. Because of these factors and problems with accessibility previously cited, water management on Gardner refuge is virtually non-existent.

REHABILITATION

An IPW, CAN-68, has been submitted for consideration by the Corps of Engineers to dredge silt and sediment intermittently from approximately eight miles of side channels and waterways. Without such a cleanout of channels, access to interior waters by refuge staff will one day be lost.

The following units are scheduled for reflooding for utilization by fall migrants:

Supply Pond	- 37 ac.	Goose Pasture	- 120 ac.
MSU 1	- 47 ac.	Crane Pond	- 21 ac.
MSU 2	- 154 ac.	Rabbit Ears Marsh	- 20 ac.
MSU 3	- 163 ac.	Stephen's Landing GTR	- 64 ac.
MSU 4	- 82 ac.	Goose Pasture GTR	- 88 ac.
MSU 5	- 126 ac.	Crane Pond GTR	- 85 ac.
MSU 6	- 37 ac.	Big Pond	- 90 ac.
MSU 7	- 465 ac.		

Total fall-flooded acreage is approximately 1,600 surface acres, plus 17 additional naturally-flooded acres in Raybourn Slough and Ballbush Pond.

Fall pumping requirements are dependent on precipitation, and pumping schedules have to be planned according to precipitation totals prior to and during fall migration. However, due to budget and fuel allocation constraints, management will be limited to using no more than approximately 2,000 gallons of fuel to accomplish the proposed reflooding plan.

The following schedule is the basic plan of action to work from in reflooding units.

1. Upon arrival of early migrant waterfowl, begin pumping water into main ditch to back-fill units. This requires closure of all water control structures south of structure D except for gates A and C (Double Main). Water is back-filled in main ditch sections C and (part of) A to an elevation sufficient to begin flooding MSUs.
2. Control structures on Supply Pond, MSU 1, and MSU 2 are opened partially to slowly flood these units. Pumps shall be operated intermittently so that it takes approximately ten days to gain approximately 100 surface acres of water in these units.
3. Both structures on Big Pond shall then be opened to shallowly flood that unit and to draw water into Stephen's Landing GTR. This shall be accomplished in approximately seven days.
4. Water will then be back-filled into main ditch section A behind structure C (Double Main). Control structures on MSU 3, MSU 4, MSU 5, and MSU 6 are opened partially to shallowly flood these units over a 14-day period.

By this time, there should be approximately 660 surface acres of water available (45% total planned) by mid-October, which begins the peak migration period for waterfowl.

5. Water is then back-filled into main ditch B, D, and E, which will allow slow flooding of MSU 7 and Goose Pasture GTR.
6. Structure E (#5) is then opened to draw water into Crane Pond and Crane Pond GTR.

The following units are scheduled for reflooding for utilization by fall migrants:

Supply Pond	- 37 ac.	Goose Pasture	- 120 ac.
MSU 1	- 47 ac.	Crane Pond	- 21 ac.
MSU 2	- 154 ac.	Rabbit Ears Marsh	- 20 ac.
MSU 3	- 163 ac.	Stephen's Landing GTR	- 64 ac.
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MSU 6	- 37 ac.	Big Pond	- 90 ac.
MSU 7	- 465 ac.		

Total fall-flooded acreage is approximately 1,600 surface acres, plus 17 additional naturally-flooded acres in Raybourn Slough and Ballbush Pond.

Fall pumping requirements are dependent on precipitation, and pumping schedules have to be planned according to precipitation totals prior to and during fall migration. However, due to budget and fuel allocation constraints, management will be limited to using no more than approximately 2,000 gallons of fuel to accomplish the proposed reflooding plan.

The following schedule is the basic plan of action to work from in reflooding units.

1. Upon arrival of early migrant waterfowl, begin pumping water into main ditch to back-fill units. This requires closure of all water control structures south of structure D except for gates A and C (Double Main). Water is back-filled in main ditch sections C and (part of) A to an elevation sufficient to begin flooding MSUs.
2. Control structures on Supply Pond, MSU 1, and MSU 2 are opened partially to slowly flood these units. Pumps shall be operated intermittently so that it takes approximately ten days to gain approximately 100 surface acres of water in these units.
3. Both structures on Big Pond shall then be opened to shallowly flood that unit and to draw water into Stephen's Landing GTR. This shall be accomplished in approximately seven days.
4. Water will then be back-filled into main ditch section A behind structure C (Double Main). Control structures on MSU 3, MSU 4, MSU 5, and MSU 6 are opened partially to shallowly flood these units over a 14-day period.

By this time, there should be approximately 660 surface acres of water available (45% total planned) by mid-October, which begins the peak migration period for waterfowl.

5. Water is then back-filled into main ditch B, D, and E, which will allow slow flooding of MSU 7 and Goose Pasture GTR.
6. Structure E (#5) is then opened to draw water into Crane Pond and Crane Pond GTR.

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Total fall-flooded acreage is approximately 1,600 surface acres, plus 17 additional naturally-flooded acres in Raybourn Slough and Ballbush Pond.

Fall pumping requirements are dependent on precipitation, and pumping schedules have to be planned according to precipitation totals prior to and during fall migration. However, due to budget and fuel allocation constraints, management will be limited to using no more than approximately 2,000 gallons of fuel to accomplish the proposed reflooding plan.

The following schedule is the basic plan of action to work from in reflooding units.

1. Upon arrival of early migrant waterfowl, begin pumping water into main ditch to back-fill units. This requires closure of all water control structures south of structure D except for gates A and C (Double Main). Water is back-filled in main ditch sections C and (part of) A to an elevation sufficient to begin flooding MSUs.
2. Control structures on Supply Pond, MSU 1, and MSU 2 are opened partially to slowly flood these units. Pumps shall be operated intermittently so that it takes approximately ten days to gain approximately 100 surface acres of water in these units.
3. Both structures on Big Pond shall then be opened to shallowly flood that unit and to draw water into Stephen's Landing GTR. This shall be accomplished in approximately seven days.
4. Water will then be back-filled into main ditch section A behind structure C (Double Main). Control structures on MSU 3, MSU 4, MSU 5, and MSU 6 are opened partially to shallowly flood these units over a 14-day period.

By this time, there should be approximately 660 surface acres of water available (45% total planned) by mid-October, which begins the peak migration period for waterfowl.

5. Water is then back-filled into main ditch B, D, and E, which will allow slow flooding of MSU 7 and Goose Pasture GTR.
6. Structure E (#5) is then opened to draw water into Crane Pond and Crane Pond GTR.